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Towards an Integrated Coastal Zone Management in Campania region (Italy): a multidisciplinary approach to the analysis of coastal fishery activities and their socio-economic management

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Abstract

The paper presents same of the main outcomes of a study concerning the application of the Integrated Coastal Zone Management (ICZM) to Campania region in Italy. The study was focused on the analysis of main uses and activities related to fishery such as the definition of thematic maps describing zones in which fishing activities are prohibited or restricted, areas of distribution of fishing effort, socio economic sustainability of local artisanal fishery, the relevance of fishing tourism and recreational fisheries, an analysis of local fish market. Data provided by official source as the Fishery Data collection, vessel traffic monitoring systems, logbook and legislative sources were successively verified by a field analysis through direct interviews to stakeholders.

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Keywords: Integrated Coastal; Zone Management; Operational Units, Impact Assessment.

1. Introductions

Integrated Coastal Zone Management (ICZM) is a dynamic process for the management and sustainable use of coastal zones, which takes into considerations all aspects of coastal ecosystems and landscapes. It aims for the coordinated application of the different policies affecting coastal zones such as nature protection, aquaculture,

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fisheries, agriculture, industry, shipping, tourism, development of infrastructure and mitigation and adaptation to climate change (European Commission, 1999). The concept of ICZM dates back to 1994, when the resolution of the EU Council of 6 May 1994 highlighted the need for an EU strategy for coastal areas based on sustainable development principles applied through an approach that respects the limits of natural resources and ecosystems. Therefore, integrated coastal management covers the full cycle of information collection, planning, decision-making, management and monitoring of implementation.

Following this approach, this paper presents some of the outcomes of an ICZM project undertaken in the Campania region - Southern Italy, a marine area of around 9200 km^2 and 474 km of coastline. This area belongs to the FAO Geographical Sub Area 10 (GSA 10) - South Tyrrhenian Sea- and includes four main coastal zones: the Domizio coast, the Gulf of Napoli, the Gulf of Salerno and the Cilento coast. As in many Mediterranean regions Campania region has a typical multi-gear and multi-species fishery, with more than 150 commercial species and a large number of fleet's segments using different types of gears and performing diversified fishing operations during the year.

Taking into account the main uses and activities interacting in the area and related to the fisheries sector, the study initially focused on the identification of Operational Units: homogenous groups of vessels targeting the same fish stocks, using the same gear, performing similar fishing operations and having a homogeneous economic structure. This preliminary phase also included the definition of thematic maps describing zones and/or periods in which fishing activities are prohibited or restricted, sites for marine fish farming and areas where the majority of the fishing effort is concentrated. An evaluation of the sustainability of small scale fishery and an analysis of the relevance of fishing tourism and of recreational fisheries were also performed. The final part of this study presents an analysis of the local fish market in order to investigate its strengthshttp://context.reverso.net/traduzione/inglese-italiano/of+strengths+and+weaknesses and weaknesses and potential actions for the valorisation and promotion of local seafood. All the phases of the study benefited from the active participation and cooperation of stakeholders involved in the fishing sector through a survey based on fifty-five face-to-face interviews.

2. Materials and Methods

Mediterranean fisheries are multi-species and multi-gear in nature. This complexity represents one of the most general features of Mediterranean fisheries, which the management system should take into account. In order to reduce this complexity the Operational Unit (OU) approach was applied by identifying homogeneous groups of vessels from biological, economic and social points of view. The identification of OUs in the Campania region was based on the definition endorsed by the GFCM in 2001 (Adriamed, 2001). OUs are defined by a multidisciplinary approach where the level of homogeneity within each group of vessels is maximized with respect to "species or group of species" targeted, "type of fishing operation" and similarity in the "economic structure" (Accadia & Franquesa, 2006). Homogeneity criteria were obtained through a fleet segmentation based on the following variables: coastal area, fishing zones, vessel's length overall (LOA) and gear type.

The individuation of the OUs started from the total number of vessels registered along the coasts of the Campania region. The fleet identified on the basis of the National Fleet Register in 2014 and consisting of approximately 1100 vessels, was divided into groups, making an effort to maximize intra-group homogeneity. The maximum level of homogeneity was evaluated with regard to the type of fishing operations, the target species and the economic structure (Fig. 1).

Two types of sources were used for the collection of data: the Data Collection Framework (DCF) as foreseen by the Regulation (EC) n. 199/2008 and survey data supported by direct interviews to local operators. Data collected through the DCF is organized by fleet segment and macro area and, therefore, is not suitable for providing the necessary information to develop a management system based on OUs. To address the problem of lack of information detailed at sub-regional level, average estimates resulting from the DCF were processed and used as a basis for the reconstruction of socio-economic data at OU level. Average data per vessel on landings in weight and value per species, fuel costs, commercial and other variable costs, maintenance and other fixed costs, labor costs and

depreciation costs were estimated. The results of these estimations were submitted, amended and finally validated through interviews to fishermen, covering all geographical areas and fishing methods of the Campania region.

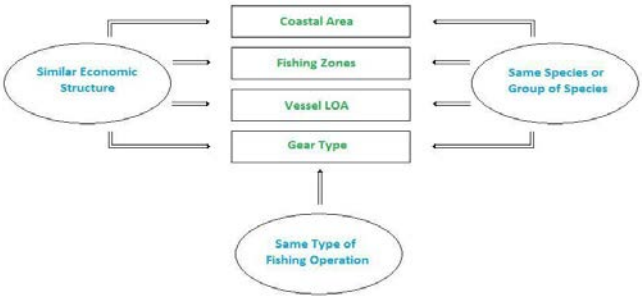

Fig. 1. Relationship between variables and criteria to identify OUs

The result was the identification of 20 OUs, broken down by four fishing areas and four fleet segments. 85% of the overall fleet belongs to classes of length of less than 12 meters and equipped with passive gears. These boats normally operate along the immediate coast, only in rare cases outside the 6 nautical miles. Most of them use gillnets (trammel and gill nets) as the main gear and bottom longlines as secondary gear. Bottom trawlers represent 16% of the regional fleet. These boats generally operate within 12 miles of the coast and in the regional boundaries. The purse seine segment includes 31 boats, mainly targeting small pelagic fish (anchovies), within 6 miles of the coast. Finally, there are 14 vessels using hydraulic dredges and concentrated in the northern part of the region (Domitio Coast). A detailed description and mapping of four study areas was also provided in order to investigate the scope and nature of the different and co-existing activities relating to fisheries. In particular, three types of maps were produced describing:

- zones and/or periods in which fishing activities were prohibited or restricted including for the protection of spawning and nursery areas
- sites for marine fish farming
- areas where most of the fishing effort was concentrated with a particular focus on zones shared by small scale vessels and trawlers

The main source for the identification and classification of thematic maps are ten Local Management Plans adopted in the Campania region and other legislative sources, such as ministerial decrees related to the establishment of protected marine areas and the Commission Decision of 28 March 2008 adopting the first updated list of sites of Community importance for the Mediterranean biogeographical region.

The mapping of the distribution areas of fishing effort was based on data provided by the VMS (Vessel Monitoring System), which was introduced in 2002 by the European Union (Regulation (EC) No 2371/2002) for the remote control of the fishing boats and collected as part of the Collection of Fisheries Data from 2006. This information was further integrated by the AIS (Automatic Identification System), which is one of the main sources of information for the SafeSeaNet, a vessel traffic monitoring and information system operated by European Maritime Sea Agency (EMSA - Agency, 2014). Specifically, 2014 VMS and AIS data related to the activity of vessels with length overall larger than 12 m were used. The VMS and AIS data were combined and processed using the VMS base platform (Russo *et al*., 2014). Starting form combined series of VMS and AIS raw pings, single fishing tracks (series of trips of a fishing vessel, starting and ending in a given harbor) were identified, cleaned and interpolated (Russo et al., 2011a) in order to obtain standardized records of vessel positions. The depth of the sea corresponding to each ping was estimated, while the gear used was determined by logbook or inferred by machine learning technique (Russo et al., 2011b). Then a combined speed/depth filter was used to distinguish between fishing and non-fishing pings. Finally, records of vessel positions in a fishing state (fishing points) were counted within each grid cell. The number of fishing points was assumed to be a reliable proxy of fishing effort, the spatial distribution of which was produced at the resolution of the 6 min grid (Russo *et al*., 2013).

On the basis of information collected and by using the Geographical Information System (GIS), it was possible to identify and map five Marine Protected Areas (MPA), five nurseries, thirteen bivalve mollusc areas, twenty two sites of Community importance for the Mediterranean biogeographical region and thirty eight maps of distribution of fishing effort by fleet segment. The processed information was previously and fully validated by local fishermen and producer organizations. Table 1 gives an overview of information collected and estimated for the Operational Unit 14, bottom trawlers 18-24m in the Gulf of Salerno, including value and volume of target species landings, main socio-economic indicators and current and potential management measures related to this fleet segment.

Table 1. Description of Operational unit 14, bottom trawlers 18-24 m. in Gulf of Salerno, 2014 (Nisea calculations on DCF data)

Target species	% on total volume	% on total value
hake	31.1%	29.0%
red mullet	13.4%	10.4%
deep water rose shrimp	11.3%	11.6%
red shrimps	4.7%	13.1%
squid	4.5%	5.0%
SOCIO-ECONOMIC INDICATORS		
Return on Fixed Tangible Assets (ROFTA)	0.01	
Current revenue/ Break even revenue (CR/BER)	1.13	
Average wage	9081	
MANAGEMENT MAESURES		
Current measures:	Fishing restrictions in MPA “Punta Campanella” and in “Penisola Sorrentina”.	
	Temporary withdrawal (30 consecutive days) and fishing stop (Saturday &Sunday)	
	Minimum mesh size for trawl nets.	
	Trawling is forbidden on Posidonia beds and on	
	fishing grounds deeper than 1000 metres	
Potential additional measures:	Voluntary temporary withdrawal for other 30 days	
	Trawling is forbidden out of 65 metres bathimetry	
	Fishing ban within 3.8 nautical miles for 30 consecutive days in June	

Current management measures are established according to national and regional regulations in force, such as fishing restrictions in closed areas or temporary withdrawal. Potential measures are those suggested by local producer organizations and concern additional restrictive technical measures, such as a voluntary withdrawal for longer periods or a more stringent ban for trawling.

Fig. 2 illustrates the distribution of fishing effort (expressed in kilowatts) of the eleven bottom trawlers between 18 and 24 metres in length (LOA) and registered within the Gulf of Salerno (U.O. 14). It is possible to observe that a large part of the effective fishing effort is concentrated in the area of registration of vessels while only a minimum part of the effort affects areas outside the boundaries of the Campania region.

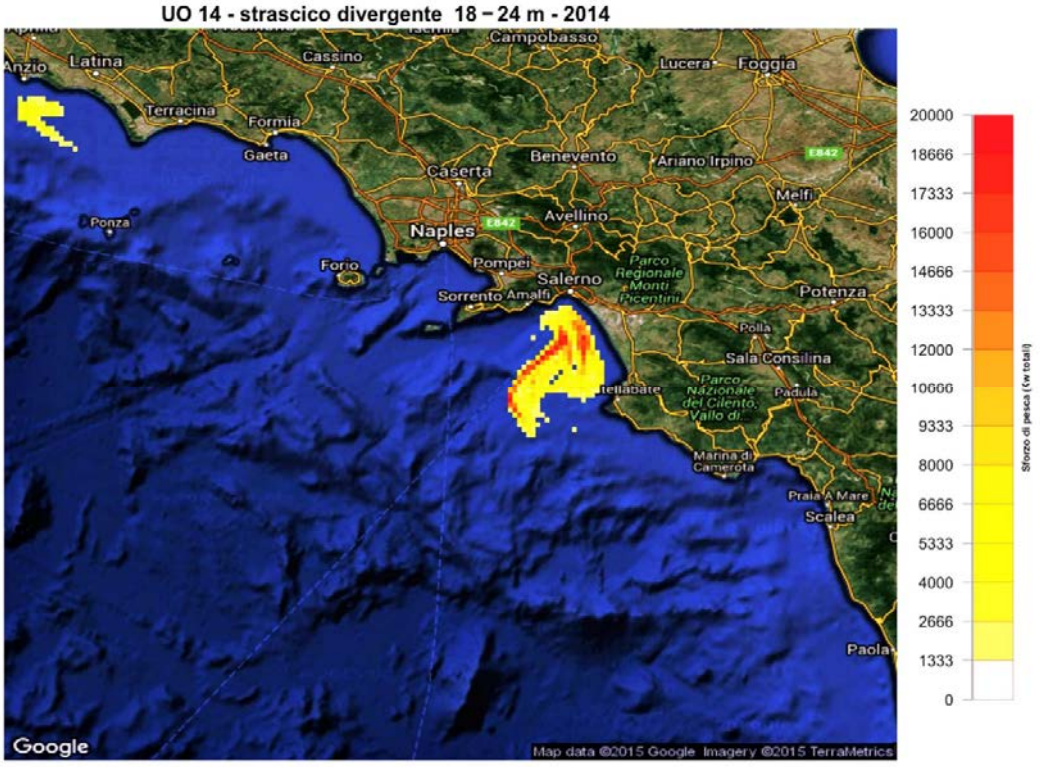

Fig. 2. Fishing Effort map of Operational Unit 14 – bottom trawlers 18-24 m. in Gulf of Salerno (VMS & AIS data)

3. Analysis of sustainability for small scale fisheries and integration among sectors

The dominant feature of the Campania region's fishing fleet is the artisanal component. Small-scale fishery accounts for almost three quarters of the whole fleet and plays an important role in the fisheries sector as well in the pursuit of social and employment objectives. The small-scale fishing fleet consists of vessels that have the following characteristics:

- Overall length of less than 12 meters
- Exclusive Use of passive gears such as gill nets, hooks, traps
- Family farms

Small-scale vessels are also characterized by high technical flexibility since they are able to convert their activity according to the period and the weather conditions. Small-scale vessels have low capital-intensity and are highly influenced by climatic conditions, market fluctuations and interaction with trawlers which often have the same target species and the same fishing grounds.

The assessment of the sustainability of small-scale fisheries in the Campania region has been conducted taking into account the objectives set by the GSA National Management Plan 10 (adopted in 2008). The reference points (RP) defined by the Plan were recalculated specifically for small-scale fishing in order to check whether and how the objectives have been achieved. The most recent EU guidelines for Impact Assessment, in fact, suggest that management measures should be evaluated with an ex - ante and ex – post analysis, according to the criterion of effectiveness (Malvarosa et *al.*, 2015).

Four indicators were calculated: the gross profit per boat and value added per employee for the economic sustainability and the number of persons employed and the average wage per employee, which represent key indicators to ensure good acceptance of management measures implemented in the area.

Table below highlight the excellent performance of the GSA Plan 10, both in economic and social terms, in the first period after its implementation (2008-2010). All four indicators are higher than corresponding refernce points, pointing out that all the management measures resulted in a good level of profitability. On the contrary, in the 2011-2013 period there is a deterioration in the economic performance. If in 2011, in fact, economic sustainability is still guaranteed, in part, by a good level of gross profit and by the maintenance of employment levels, since 2012 profitability decreases due, essentially, to a reduction in landings and, since 2013, of sale prices. The data collected highlight that between 2010 and 2014 a decline in fishing activity and production affected small scale fishery, with a reduction of 17% in terms of days at sea and a drop in daily productivity from 32 Kg in 2014 to 25 Kg in 2014. Over the same period, the number of employees declined considerably with a loss of 200 units since 2010. Several factors affected the decrease in production, such as the over exploitation of most target species in the area (Mannini & Sabatella, 2015), the increase in fuel price and the restrictions set by Council Regulation (EC) n. 1967/2006 concerning management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea. In particular, some measures such as the ban on the catch of juvenile pilchard, implemented on 1st June 2010, heavily affected profitability of fleets this fishery represented a significant source of income integration for many coastal communities and, therefore, had a socio-economic and employment importance.

Table 2. Socio-economic sustainability evaluation of GSA 10 Italian Management Plan for small fishery in Campania, 2008-2014. (Nisea calculations on DCF data)

Year	Economic dimension				Social dimension			
	Gross profit per vessel		Added value/employee		No employees		average salary	
	Results	LRP	Results	LRP	Results	LRP	Results	LRP
2008	12390	6868	12598	9666	1596	1335	5182	4617
2009	11901	6868	12618	9666	1535	1335	5246	4617
2010	13880	6868	14199	9666	1577	1335	5814	4617
2011	14019	12986	13407	14775	1693	1265	5493	6102
2012	10049	12986	10110	14775	1613	1265	4293	6102
2013	8069	12986	10856	14775	1302	1265	5118	6102
2014	9577	12986	12967	14775	1375	1265	6401	6102

Conflicts between professional fishery, fishing tourism and recreational fishing in relation to the exploitation of fishery resources has been conducted through interviews to local fishermen. As concerns fishing tourism, most interviews were conducted in tourist areas, such as the Cilento coast and Ischia, and in archaeological sites such as Portici and Ercolano. Although fishing tourism has great potential for development in these areas its importance is still rather low (<30% of total vessels and total income). A number of factors hinder the development of this alternative source of income: higher costs for the adaptation of boats, complex administrative procedures, obstacles in accessing funding.

As concerns sport and recreational fishing, this activity presents numerous problems, mainly due to the little control on recreational vessels and to limited available information concerning recreational catches. The results of interviews show how recreational fishing in the Campania region assumes, often, the contours of a legal violation. What emerges in most cases, is that catches from recreational fishing, whilst being in compliance with the legal limits (for size, weight and species) are not intended for self-consumption but are nevertheless sold at the same landing sites as commercial fishery or door to door. A signal of this violation is that the number of the recreational boats is higher than professional boats. In addition, fishing interviews also denounce the presence of vessels coming from neighboring areas, especially large purse seiners and trawlers. The presence of fishing vessels belonging to other administrative regions was also confirmed by data collected through the Vessel Monitoring System (VMS).

4. Valorisation and promotion of local seafood

The regional fish market is one of the most interesting at the national level in terms of household consumption. In the Campania region the propensity to consumption of fish products is very high with an average monthly household expenditure of €57 while the national average is €41 (ISTAT, 2016). Regional seafood consumption is only partially satisfied by domestic production. This is due not only to the low productivity of the Tyrrhenian Sea, but also to inefficiencies in the distributional system which emerged from the survey.

In the absence of information and studies related to the perception of local seafood products, a survey was conducted on the basis of direct interviews with five main stakeholders: canteens of universities and hospitals, social cooperatives, persons in charge of collective purchases, a celiac association, wholesale markets. All stakeholders expressed their willingness to buy local product at pre-established prices and to enrich their menu with local fish products. Also large retail chains showed interest in offering local fish to attract new customers. From interviews with the collective and social purchasers and associations, such as the celiac association or the Slow Food organization it emerged that more than 70% of interviewed persons showed interest and enthusiasm for new agreements with the fishermen for the so called "zero mile". However, most local fishermen don't belong to producer organizations and can't participate in public tenders to provide public entities or can't guarantee required food hygiene packages. The scarcity of landing sites in the region is another obstacle to the valorization of local seafood.

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